Application No.: 10/815056
Amendment Dated: January 25, 2008
Reply to Office action of: September 25, 2007 and
to Advisory Action of December 14, 2007

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method comprising:

fragmenting a database into a plurality of database fragments using at least one fragmentation expression, the at least one fragmentation expression ~~corresponding to~~ specifying a content of one of the plurality of database fragments, ~~and~~ the fragmentation expression including:

a boolean combination of one or more comparison-predicates,

wherein each comparison-predicate:

defines a range of a fragmentation dimension basis function of one or more database fields;

processing a database query against the database fragments of the database, based on the boolean combination of said one or more comparison-predicates; and

providing results of the processing to a user of the database.

2. (Previously presented) The method as set forth in claim 1, wherein the processing of a database query comprises:

resolving a data selection expression of the database query into a boolean

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combination of fragment selection comparison-predicates wherein each fragment selection comparison-predicate defines a range of one of the fragmentation dimension basis functions;

identifying one or more eliminated database fragments based on the boolean combination of fragment selection comparison-predicates and a fragmentation scheme; and

processing the database query against database fragments other than the eliminated database fragments.

3. (Original) The method as set forth in claim 2, wherein the resolving of the data selection expression into a boolean combination of fragment selection comparison-predicates comprises:

identifying a comparison-predicate of the data selection expression, the comparison-predicate including a comparison operator comparing a constant value with a candidate function that depends upon one or more database fields; and

converting the identified comparison-predicate into one or more of the fragment selection comparison-predicates.

4. (Original) The method as set forth in claim 3, wherein the converting comprises:

identifying the selected candidate function as equivalent to one of the fragmentation dimension basis functions.

5. (Original) The method as set forth in claim 3, wherein the converting

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comprises:

applying a monotonic transform to the candidate function and to the constant value of a identified comparison-predicate, the application of the monotonic transform converting the candidate function into one of the fragmentation dimension basis functions.

6. (Original) The method as set forth in claim 5, wherein the applying of a monotonic transform comprises:

applying an extraction function to the candidate function and to the constant value of the identified comparison-predicate.

7. (Original) The method as set forth in claim 6, wherein applying the extraction function increases granularity, the comparison operator of the identified comparison-predicate is an exclusive comparison operator, and the converting further comprises:

replacing the exclusive comparison operator with an inclusive comparison operator.

8. (Original) The method as set forth in claim 5, wherein the candidate function of the identified comparison-predicate is an extraction of one of the fragmentation dimension basis functions, and the applying of a monotonic transform comprises:

substituting the fragmentation dimension basis function for the candidate function of the identified comparison-predicate; and

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substituting a new value for the constant value of the identified comparison-predicate, the extraction applied to the new value producing the constant value.

9. (Original) The method as set forth in claim 5, wherein the applying of a monotonic transform includes:

applying a monotonic transform that changes granularity; and

selecting an endpoint of a range of the transformed identified comparison-predicate to ensure that the range of the transformed identified comparison-predicate includes the entire range of the identified comparison-predicate.

10. (Original) The method as set forth in claim 5, wherein the applying of a monotonic transform includes:

applying a monotonically decreasing transform to the candidate function and to the constant value of the identified comparison-predicate; and

reversing a directionality of the comparison operator of the identified comparison-predicate.

11. (Original) The method as set forth in claim 3, wherein the converting of the identified comparison-predicate into one or more of the fragment selection comparison-predicates includes:

converting the identified comparison-predicate into a fragment selection comparison-predicate having a range that (i) is larger than the range of the identified comparison-predicate and (ii) includes the range of the identified comparison-predicate.

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12. (Original) The method as set forth in claim 3, wherein the converting of the identified comparison-predicate into one or more of the fragment selection comparison-predicates includes:

converting the identified comparison-predicate into a fragment selection comparison-predicate having a smaller granularity than the identified comparison-predicate, an endpoint of the range defined by the fragment selection comparison-predicate being selected to include the entire range of the identified comparison-predicate.

13. (Currently amended) The method as set forth in claim 1, wherein the processing of a database query comprises:

recognizing the query as a row insert or row update operation including a plurality of new record fields corresponding to database fields of the database;

computing fragmentation dimension values corresponding to the fragmentation dimension basis functions using the new record fields as inputs; and

inserting or updating using the new record fields in an identified one of the database fragments whose corresponding fragmentation expression is satisfied by the computed fragmentation dimension values.

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14. (Currently Amended) A fragmented database comprising:

a fragmentation scheme including:

(i) one or more fragmentation dimension basis functions wherein each fragmentation dimension basis function depends upon one or more database fields, and

(ii) a plurality of fragmentation expressions, each fragmentation expression being defined by:

a boolean combination of comparison-predicates wherein each comparison-predicate:

defines a range of at least one of the fragmentation dimension basis functions; and

a plurality of database fragments, each database fragment containing data satisfying a corresponding one of the plurality of fragmentation expressions, thereby enabling improved query efficiency by utilization of fragment elimination based on the fragmentation scheme during query processing which produces query results for a user of the database.

15. (Previously presented) The fragmented database as set forth in claim 14, further comprising:

a query processor performing a method including (i) receiving a database query and (ii) processing the database query against the plurality of database fragments; and

a fragment elimination processor performing a method including:

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(i) resolving a data selection expression of the database query into a boolean combination of fragment selection comparison-predicates wherein each fragment selection comparison-predicate defines a range of one of the fragmentation dimension basis functions, and

(ii) eliminating one or more of the plurality of database fragments from the processing of the database query by the query processor, the eliminating being based on comparison of the boolean combination of fragment selection comparison-predicates with the fragmentation expressions.

16. (Original) The fragmented database as set forth in claim 14, wherein the one or more fragmentation dimension basis functions comprise:

a first fragmentation dimension basis function depending upon at least a first database field; and

a second fragmentation dimension basis function depending upon at least the first database field.

17. (Original) The fragmented database as set forth in claim 14, wherein the one or more fragmentation dimension basis functions comprise:

a fragmentation dimension basis function that depends upon at least two database fields.

18. (Original) The fragmented database as set forth in claim 14, wherein the one or more fragmentation dimension basis functions comprise:

a fragmentation dimension basis function that includes an extraction operator.

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19. (Currently Amended) A storage medium encoding program code for performing database functions, the program code comprising:

program code for constructing a fragmented database having a fragmentation scheme constructed based on computed values of fragmentation dimension basis functions, each fragmentation dimension basis function configured to compute the values based upon at least one database field, the fragmentation scheme being defined by a boolean combination of comparison-predicates, in which each comparison predicate defines a range of selected ones of said fragmentation dimension basis function; and

program code for inserting a new record into the fragmented database, the inserting including (i) computing values of the fragmentation dimension basis functions using the at least one database field of the new record, (ii) selecting a target database fragment based on the fragmentation scheme and the computed values of the fragmentation dimension basis functions, and (iii) inserting the new record into the target database fragment.

20. (Original) The storage medium as set forth in claim 19, wherein the program code further comprises:

program code for performing a database query, the performing including (i) resolving a data selection expression of the database query into one or more one-dimensional expressions each dimensioned by one of the fragmentation dimension basis functions, (ii) identifying at least one eliminated database fragment based on the one or more one-dimensional expressions and the fragmentation scheme, and

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(iii) processing the database query against the database fragments other than the at

least one eliminated database fragment.